METHOD FOR CLEANING MEAT PROCESSING FACILITIES

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ABSTRACT

A cleaning method and system for meat smokehouses and similar meat processing facilities including a plurality of atomizing spray nozzles positioned within the smokehouse and the duct work therein. While air and steam are circulated within the smokehouse, a cleanser solution is introduced into the facility through the atomizing spray nozzles. The atomized cleaning solution provides a saturated atmosphere of cleanser which is carried to all surfaces of the smokehouse by the circulating air. After completion of the wash operation, pure water and/or a weakly acid aqueous solution is introduced into the smokehouse through the nozzle system to effect rinsing of the smokehouse.

8 Claims, 2 Drawing Figures
METHOD FOR CLEANING MEAT PROCESSING FACILITIES

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention pertains to a system and method for cleaning a wide variety of enclosures such as food processing facilities.

2. Description of the Prior Art

Numerous approaches are presently available for cleaning and sanitizing an enclosure such as a food processing facility (e.g., a meat smokehouse). One approach is simply to hand clean all exposed surfaces utilizing a cleaning solution appropriate for removing the dirt, fat and meat wastes which typically accumulate on the walls, ceilings and floors of a smokehouse. This approach, however, is extremely time consuming and generally does not provide access to the many small and hidden areas within the smokehouse nor to the duct work for circulating air and steam within the enclosure. Additionally, to provide the desired cleaning and sanitizing, a cleansing solution having highly basic properties is generally utilized necessitating extreme caution by the personnel responsible for the cleaning operation. Alternatively, nozzle systems of a non-atomizing type are presently positioned within a smokehouse for exhausting a jet of cleaning solution therethrough and directing the jet toward selected surface areas of the facility. While such a spray system is generally an improvement over hand cleaning methods, it requires a relatively large volume of highly basic cleansing solution to effect proper cleaning. Additionally, these systems are limited in their ability to contact the entire surface area of the enclosure. This limitation is due largely to the fact that the nozzle system directs a jet spray only toward certain well defined areas of the smokehouse; the remainder of the enclosure not being directly contacted by cleaning solution. A third approach utilizing foam cleaning is also limited insofar as the spray of foam does not contact all areas of the smokehouse.

In summary, application of the above-noted approaches has neither provided adequate cleaning nor efficiency to the extent desired. As a result, the need for a thorough, yet efficient system for cleaning food processing plants, as well as various other facilities, is widely recognized.

SUMMARY OF THE INVENTION

The present invention pertains to a system and method for cleaning enclosures (e.g., smokehouses and other food processing facilities). The system comprises conduit means connectable to a source of cleansing solution and which extend within the enclosure preferably along the ceiling thereof. A plurality of atomizing spray nozzles are connected to the conduit means for emitting an atomized spray of cleansing solution to create an essentially saturated atmosphere within the enclosure. Air circulating means are provided to cause movement of the saturated cleaning atmosphere to essentially all areas of the enclosure. Preferably, the present system is utilized in facilities having duct work for circulating air within the facility. Here, a number of the atomizing spray nozzles are positioned within the duct work, and the air circulating means are operated during the cleaning operation to circulate the atomized solution throughout the duct work as well as the enclosure.

The saturated atmosphere of cleansing solution assures that essentially all surfaces of the enclosure (including the duct work) are contacted by cleansing solution. This, of course, significantly increases the cleansing action assuring that all soil and other waste deposits are loosened and removed without necessitating as concentrated a cleansing solution as heretofore utilized. Additionally, the continually circulated atmosphere provides continuous application of cleansing solution within the entire enclosure without the need for large volumes of cleansing solution. This reduction in the necessary volume of cleansing solution overcomes a substantial disadvantage of the prior art spray systems. Further, the utilization of a saturated atmosphere of cleansing solution has been found to eliminate the need for preheating the smokehouse or other enclosure to a relatively high temperature, a practice which is commonly followed at the present time. Finally, the present system can be designed so as to function completely automatically if desired. Additional advantages of the present invention, such as the non-criticality of the nozzle placement within the enclosure, will become readily apparent from a reading of the Detailed Description which follows.

BRIEF DESCRIPTION OF THE DRAWINGS

Referring now to the drawings, wherein like numerals represent like elements of the invention throughout the two figures:

FIG. 1 is a diagramatic view in perspective of a smokehouse utilizing the cleaning system provided by the present invention, portions thereof being broken away; and

FIG. 2 is a transverse cross-sectional view of the smokehouse and cleaning system shown in FIG. 1, portions thereof being broken away.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT AND METHOD

In the drawings, the numeral 10 generally designates the cleaning system provided by the present invention. Cleaning system 10 is utilizable for cleaning a wide variety of washable facilities or room-like enclosures such as a smokehouse 12 for processing meats (e.g., cooking, smoking and curing) by subjecting the meat to heat and to a dense smoke. As the application of the present invention in the cleaning of smokehouses and similar food processing facilities is highly advantageous vis-a-vis present approaches, the description herein will be limited to such use. Other applications will, however, be readily apparent to the artisan.

As shown, the smokehouse 12 has front and rear walls 12a and 12b, respectively, sidewalls 12c and 12d and a ceiling 12e supported by the upright walls. Typically, smokehouse 12 will have a width of about 20 feet and a length of about 40-60 feet, but no one set of dimensions is standard within the meat processing industry.

Cleaning system 10 includes a source of a cleansing or wash solution such as a reservoir 15. The wash solution is suitable for removing the soil, meat and fat wastes which typically accumulate within the smokehouse 12. Generally speaking, the cleansing solution is an alkaline solution including agents to provide wetting ability and to prevent mineral accumulations within the cleansing system. Several particularly desirable solutions are subsequently described. Conduit means in the
form of a pipe 18 is connected to the reservoir 15 and extends within the smokehouse 12 wherein the pipe 18 branches into a plurality of branch conduits or pipes 18a, 18b and 18c. The pipes 18a–18c are preferably positioned adjacent the ceiling 12e of smokehouse 12 (e.g., attached to the ceiling 12e by a plurality of brackets 19 within the duct work subsequently described) and extend longitudinally within the smokehouse in a laterally spaced relationship generally the entire length thereof. A greater or lesser number of branch conduits may be desirable depending on the size of smokehouse 12 and various additional factors.

As shown, smokehouse 12 is of a type having an air circulating duct work system 25 extending longitudinally within smokehouse 12 along the ceiling 12e. The duct work 25 includes a pair of air supply ducts 27a and 27c and a centrally positioned air return duct 27b, each extending longitudinally within smokehouse 12 adjacent ceiling 12e thereof. Air circulating means in the form of a blower 28 draws air from the smokehouse 12 into the return duct work 27b and then exhausts the air back into the smokehouse through the supply ducts 27a and 27b. This results in generally continuous circulation of the air within smokehouse 12. As shown, the two outer branch conduits 18a and 18c are mounted within the duct work 27a and 27c, respectively, and extend longitudinally therein. The branch conduit 18b is shown mounted adjacent the inner side of the return surface of the return duct work 27b so that the connected nozzles (subsequently described) extend beneath duct 27b. Conduit 18b can, however, be positioned within duct work 27b in a manner similar to conduits 18a and 18c.

Finally, a conduit 30 extends longitudinally within each of the ducts 27a–27c. Conduit 30 is connected to a source of steam (not shown) which is exhausted into duct work 27a–27c through a plurality of outlet openings 31 in the portion of conduit 30 extending within the duct work. The introduction of steam into smokehouse 12 raises the temperature thereof for the reason subsequently described. However, it should be understood that the utilization of steam is not critical to the present invention but rather can be replaced by an alternative heat source (or simply need not be utilized).

A plurality of atomizing nozzles 32 are connected to the conduits 18a, 18b, 18c for atomizing the cleansing solution conveyed from reservoir 15 so as to create an essentially saturated atmosphere of cleansing solution within smokehouse 12. Preferably, the nozzles 32 are longitudinally positioned along pipes 18a–18c in an equably spaced relationship, but it should be understood that neither the number of nozzles 32 or the spacing thereof is critical to the present invention so long as an essentially saturated atmosphere of cleansing solution is obtained within smokehouse 12. Various different types of atomizing nozzles are commercially available. For instance, one particularly desirable atomizing nozzle is Model No. 1/4M26 manufactured by Spraying Systems Company.

The conduit 18 has a pump 35 positioned therein for conveying cleansing solution between solution reservoir 15 and smokehouse 12. Pump 35 operates at relatively low pressures (e.g., 40–60 p.s.i.). A second conduit 40 has a first end connected to a source of water (not shown) and the second end thereof connected to conduit 18 between wash solution reservoir 15 and pump 35. A pair of manually operated valves 42 and 44 are positioned within conduit 18 and 35, respectively, for controlling the respective flows of cleansing solution and water into the smokehouse 12. By proper setting of the valves 42 and 44, solutions varying from 100% cleansing solution to 100% water or any mixture therebetween can be obtained. It should be understood that valves 42 and 44 can be remotely controlled if it is desired to automate cleansing system 10 (e.g., by utilizing various types of commercially available air-operated or electro-mechanical valves).

As previously mentioned, numerous cleansing solutions can be utilized in conjunction with the present cleansing system. One particularly preferred solution is mixed in a 300 gallon batch containing 5 gallons NaOH (50%), one-half gallon of a liquid detergent consisting essentially of alkyl benzene sulfonate, lauric diethanol amide and sulfated alkyl phenol ethoxylate, one-half gallon of a chelating additive (containing chelating agents such as sodium gluconate, sodium polyphosphates, nitritotriacetic acid or salt and organo phosphorus agents) and the balance tap water. The water conditioning agent significantly reduces plugging of the nozzles 32 when a hard water supply is utilized and increases cleaning efficiency. Alternatively, 25 pounds of "Estem" (a registered trademark of Economics Laboratory, Inc.) can be mixed in 300 gallons of water; or 10 gallons "Klenzmation" (a registered trademark of Economics Laboratory, Inc.), one-third gallon of a chelating additive and one-third gallon of a wetting agent such as described above can be mixed in a 300 gallon batch.

A preferred method of cleaning smokehouse 12 is as follows. After the meat and other damageable substances are removed from smokehouse 12, the smokehouse is preheated to a temperature within the range 110°–150°F. (e.g., 125°F.) by the addition of steam into duct work 25 and smokehouse 12 through conduit 30. Other suitable heat sources can also be utilized to preheat steam smokehouse 12. After preheating, steam is continually added to smokehouse 12 to maintain the 125°F. temperature. Blower 28 is activated to circulate the steam within the smokehouse. Similarly, the wash solution is heated to and maintained at a temperature of about 125°–180°F. (e.g., 140°F.). With valve 42 fully open and valve 44 fully closed, pump 35 is energized so as to pump the wash solution from reservoir 15 into smokehouse 12 through the conduit 18, branch conduits 18a–18c and atomizing nozzles 32. The introduction of wash solution into smokehouse 12 through atomizing nozzles 32 creates a saturated atmosphere of wash solution within the smokehouse. The atomization of wash solution is allowed to continue until the entire 300 gallon supply of solution has been exhausted. Then, an additional period of approximately 5–15 minutes (e.g., 10 minutes) is allowed to elapse with blower 28 activated and steam continually introduced into smokehouse to assure exposure of all surface areas of smokehouse 12 to the saturated cleansing atmosphere. The wash solution is carried away from smokehouse 12 through suitable drains (not shown) in the floor thereof. It should be understood, however, that means can be provided for recycling the wash solution if desired.

After completion of the wash operation, valve 44 is opened and rinse water is drawn by pump 35 through conduit 18 and atomized in the smokehouse 12 by the nozzles 32. The introduction of rinse water into the
smokehouse 12 is allowed to continue until the wash solution is sufficiently diluted so as to reduce its presence on the surface areas of the smokehouse below that of an injurious quantity. Preferably, the steam supply is terminated prior to completion of the rinse operation (e.g., about 5 minutes before closing valve 44). This provides for efficient and fast cooling of smokehouse 12 from its elevated temperature to a temperature at which meat can be reintroduced into the smokehouse. Finally, approximately 10 ounces of a food grade acid are added to a 100 gallon supply of water and introduced into the smokehouse 12 through the nozzles 32. This acid bath can be contained in reservoir 15 or, alternatively, an additional reservoir (not shown) or other means of supply can be provided and connected to conduit 18. A short rinse operation (e.g., 3 minutes) can be utilized to remove the excess acid from the surface areas of smokehouse 12, but this step is not necessary to the present method.

As should be apparent from the above, numerous modifications can be made to either the described cleansing system or the described method of utilizing this system without departing from the present invention. For instance, various operating parameters such as temperature and time can be readily modified in a manner so as not to significantly affect the cleansing action. This being the case, it is my intent to be limited solely by the spirit and scope of the appended claims.

What is claimed is:

1. A method for cleaning food waste and soil from a room-like enclosure defining an enclosed space, said method comprising:
   a. preheating the enclosed space to a temperature of about 110°F – 160°F;
   b. preheating a cleansing solution to a temperature of about 125°F – 180°F;
   c. injecting the cleansing solution into said enclosed space through a plurality of atomizing spray nozzles positioned within the enclosure to create an essentially saturated atmosphere of cleansing solution within said enclosed space;
   d. washing food waste and soil from said enclosed space by circulating the saturated atmosphere within said enclosed space so as to contact essentially all surface areas of said enclosed space with said essentially saturated atmosphere.

2. The method of claim 1, wherein said step (a) comprises introducing steam into the enclosure to effect the preheating, and wherein said introduction of steam is continued during said step (c).

3. The method of claim 1, wherein, subsequent to said step (d), said enclosed space is rinsed by means of water exhausted from said atomizing spray nozzles.

4. The method of claim 3, wherein the rinsing of said enclosed space is carried out by injecting essentially pure water into said enclosed space through said atomizing spray nozzles.

5. The method of claim 3, wherein the rinsing of said enclosed space includes the step of injecting a weakly acidic solution into said enclosed space through said atomizing spray nozzles.

6. A method for cleaning the interior of a smokehouse having duct work and an operably associated blower for air circulation in said interior, said method comprising:
   a. preheating the interior of the smokehouse to a temperature within the range of 110°F – 160°F. by injecting steam into said duct work and activating said blower;
   b. atomizing a detergent solution which has been preheated to about 125°F – 180°F. and introducing the atomized detergent solution into said interior to create a saturated atmosphere of detergent solution;
   c. permitting about 5 to about 15 minutes to elapse with the blower activated and steam continually introduced into said interior to circulate said saturated atmosphere throughout said interior and remove food waste and soil from essentially all surface areas therein;
   d. introducing an atomized spray of an aqueous rinse agent into said interior until wash solution remaining on said surface areas is diluted to an essentially non-injurious concentration.

7. A method according to claim 6, wherein said aqueous rinse agent comprises a weakly acidic aqueous solution.

8. The method according to claim 6, wherein step (d) comprises introducing an atomized spray of rinse water followed by an atomized spray of weakly acidic aqueous solution.